

**Claims**

1. A system for efficient routing in a multiple hop wireless communication network comprising a plurality of network nodes, characterized in that  
5 the system comprises  
means (3001) for acquiring quality information indicating link status between said infrastructure nodes;  
means (3002) for using said link quality information in a route determination process in the infrastructure nodes using a  
10 predictive procedure;  
said link quality information containing information about a time varying information of said link status; and  
said predictive procedure uses said time varying information of link status in the predictive procedure; and  
15 routing means (101) for routing data packets according to a determined route.
2. The system according to claim 1, characterized in that said wireless communication is a transmission system based on electromagnetic  
20 radiation with a frequency in the range of 100 kHz to 100 PHz.
3. The system according to claim 2, characterized in that said transmission system is one or several of IEEE 802.11, IEEE 802.15, IEEE 802.16, HiperLAN, HomeRF, Bluetooth, IR, UWB, JTRS, 3G, GPRS, or EDGE.  
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4. The system according to claim 1, comprising a reactive ad hoc routing protocol.
5. The system according to claim 1, comprising a proactive ad hoc routing  
30 protocol.
6. The system according to claim 1, comprising a combination of reactive and proactive ad hoc routing protocols.
7. The system according to claim 1, characterized in that said link status  
35 information is radio channel status information given by measurement of at least one of Doppler spread, coherence time, average fading duration, signal strength, or signal to interference noise ratio.

- 5           8. The system according to claim 1, characterized in that said predictive procedure for an ad hoc routing protocol uses obtained link status information and a radio channel information in a comparison with determined routing anticipation criteria.
- 10           9. The system according to claim 4, characterized in that said predictive model for said reactive ad hoc routing protocol obtains information about link status and a radio channel status from modified RREP, Hello messages, Acknowledgements, or RERR messages.
- 15           10. The system according to claim 5, characterized in that said predictive model for said proactive ad hoc routing protocol comprises a modified routing table containing a route status field with information about a link status.
- 20           11. The system according to claim 1, characterized in that said link status information comprises energy status of nodes in the network.
- 25           12. The system according to claim 1, characterized in that said link status information comprises number of NACK or ACK signals between nodes in the network.
- 30           13. The system according to claim 1, characterized in that said link status information comprises number of bit errors in a communication between nodes in the network.
14. The system according to claim 1, characterized in that said link status information comprises information about ownership of nodes in the network.
15. A routing protocol used in a system according to claim 1.
- 35           16. The routing protocol according to claim 15 being one of a proactive ad hoc routing protocol, reactive ad hoc routing protocol, or a combination of a proactive and reactive ad hoc routing protocol.

17. A method for efficient routing in a wireless communication network comprising a plurality of nodes, the method comprising the steps of:  
acquiring link status between nodes;  
updating a routing element with link status information;  
5 determining an efficient route according to a predictive procedure using said link status information; and  
routing traffic according to said determined route.
18. The method according to claim 17, wherein said route determination  
10 step comprise the step of using a reactive ad hoc routing protocol.
19. The method according to claim 17, wherein said route determination  
step comprise the step of using a proactive ad hoc routing protocol.
20. The method according to claim 17, characterized in that said route  
15 determination step comprise the step of using a combination of reactive and proactive ad hoc routing protocols.
21. The method according to claim 17, wherein said acquiring step acquires  
20 wireless link status information from measurements of at least one of Doppler spread, coherence time, average fading duration, signal strength or signal to interference noise ratio.
22. The method according to claim 17, wherein said predictive procedure  
25 for an ad hoc routing protocol comprise the step of using obtained link status information in a comparison with determined routing anticipation criteria.
23. The method according to claim 18, wherein said predictive procedure  
30 for said reactive ad hoc routing protocol comprise the step of obtaining information about link status from modified RREP, Hello messages Acknowledgements or RERR messages.
24. The method according to claim 19, wherein said predictive procedure  
35 for said proactive ad hoc routing protocol comprise the step of modifying a routing table with a route status field with information about link status.

25. The method according to claim 17, wherein said link status information comprises energy status of nodes in the network.
- 5 26. The method according to claim 17, wherein said link status information comprises number of NACK or ACK signals between nodes in the network.
- 10 27. The method according to claim 17, wherein said link status information comprises number of bit errors in a communication between nodes in the network.
28. The method according to claim 17, wherein said link status information comprises information about ownership of nodes in the network.
- 15 29. The method according to claim 17, characterized in that said wireless communication is a transmission system based on electromagnetic radiation with a frequency in the range of 100 kHz to 100 PHz.
- 20 30. The node (800) according to claim 29, characterized in that said transmission system is one or several of IEEE 802.11, IEEE 802.15, IEEE 802.16, HiperLAN, HomeRF, Bluetooth, IR, UWB, JTRS, 3G, GPRS, and EDGE.
- 25 31. A node (800) for efficient routing in a multiple hop wireless communication network characterized in that said apparatus comprises:  
link quality acquiring means (3001);  
link status monitoring means (102), feeding link status information to;  
routing means (101) determining an appropriate route according  
30 to said link quality information using a predictive procedure.
32. The node (800) according to claim 31, characterized in that said wireless communication is a transmission system based on electromagnetic radiation with a frequency in the range of 100 kHz to  
35 100 PHz.
33. The node (800) according to claim 32, characterized in that said transmission system is one or several of IEEE 802.11, IEEE 802.15,

IEEE 802.16, HiperLAN, HomeRF, Bluetooth, IR, UWB, JTRS, 3G, GPRS, and EDGE.

- 5           34. The node (800) according to claim 31, comprises a reactive ad hoc routing protocol.
35. The node (800) according to claim 31, comprises a proactive ad hoc routing protocol.
- 10          36. The node (800) according to claim 31, comprises a combination of reactive and proactive ad hoc routing protocols.
37. The node (800) according to claim 32, characterized in that said link status information is radio channel status information given by  
15          measurement of at least one of Doppler spread, coherence time, average fading duration, signal strength, or signal to interference noise ratio.
38. The node (800) according to claim 37, characterized in that said  
20          predictive procedure for an ad hoc routing protocol uses obtained link status information and radio channel information in a comparison with determined routing anticipation criteria.
39. The node (800) according to any of claims 34 or 37, characterized in  
25          that said predictive procedure for said reactive ad hoc routing protocol obtains information about link status and radio channel status from modified RREP, Hello messages, Acknowledgements, or RERR messages.
40. The node (800) according to any of claims 35 or 37 characterized in  
30          that said predictive procedure for said proactive ad hoc routing protocol has a modified routing table containing a route status field with information about radio link status.
41. The node (800) according to claim 31, characterized in that said link  
35          status information comprises energy status of nodes in the network.

42. The node (800) according to claim 31, characterized in that said link status information comprises number of NACK or ACK signals between nodes in the network.
- 5        43. The node (800) according to claim 31, characterized in that said link status information comprises the number of bit errors between nodes in the network.
- 10       44. The node (800) according to claim 31, characterized in that said link status information comprises information about ownership of nodes in the network.
- 15       45. An interlayer coordination for use in a wireless communication network comprising:  
          a first layer (L1) comprises radio channel information acquiring means (3001);  
          a second layer (L2) comprises link status information acquiring means (115); and  
          a third layer (L3) comprises link status monitoring means (102)  
20       obtaining radio channel and link status information from the first and second layers, route determining means (3002) using said link status information in a predictive procedure, and routing means (101) for routing data via determined route.
- 25       46. A computer program for controlling routing in a multiple hop wireless communication network comprising:  
          a first instructions set for acquiring link status information between infrastructure nodes;  
          a second instruction set for determining an efficient route using  
30       said acquired link status information in a predictive procedure; and  
          a third instruction set routing traffic according to said determined route.
- 35       47. An article of manufacture comprising a computer program for controlling routing in a multiple hop wireless communication network comprising:  
          a first instructions set for acquiring link status information between infrastructure nodes;

a second instruction set for determining an efficient route using said acquired link status information in a predictive procedure; and a third instruction set routing traffic according to said determined route.

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48. A method for efficient routing in a wireless network characterized in that data packets are routed using the following steps:

providing a link status information by measuring link status quality between infrastructure nodes in the network;

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updating a routing element with said link status information;

determining a route using said link status information;

routing said data packet via said determined route; and

upon detection of a routing failure of a data packet, retransmitting said data packet via a different route determined using a

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predictive procedure using link status information of infrastructure nodes in the wireless network.